CONTENTS

Preface ix

Progress in chemical beam epitaxy
W.T. Tsang 1

Recent progress in MOVPE for HEMT LSIs
J. Komeno, H. Tanaka, N. Tomesakai, H. Itoh, T. Ohori, M. Takikawa, M. Suzuki and K. Kasai 30

High throughput vacuum chemical epitaxy
L.M. Fraas, E. Malocsay, V. Sundaram, R.W. Baird, B.Y. Mao and G.Y. Lee 35

Gas source Si-MBE
H. Hirayama, M. Hiroi, K. Koyama and T. Tatsumi 46

Laser assisted chemical beam epitaxy
K. Nagata, Y. Iimura, Y. Aoyagi and S. Namba 52

Modulated-beam mass spectrometry studies of the MOMBE growth of (100) GaAs and $In_{0.1}Ga_{0.9}As$
T. Martin and C.R. Whitehouse 57

Observations on RHEED intensity oscillations during the growth of GaSb and InAs by MOMBE
T. Kaneko, H. Asahi, Y. Okuno, T.W. Kang and S. Gonda 69

Mass spectrometric study of the reaction of trimethylgallium and GaAs
Y. Ohki and Y. Hiratani 77

Modulated molecular beam and RHEED studies of MBE and MOMBE growth
E.M. Gibson, C.T. Foxon, J. Zhang and B.A. Joyce 81

Understanding growth mechanisms using metalorganic sources
C.T. Foxon 87

Optoelectronic devices by GSMBE
L. Goldstein 93

High-purity InP grown by gas source molecular beam epitaxy (GSMBE)
M. Lambert, A. Péralès, R. Vergnaud and C. Starck 97

Growth of InP, InGaAs, and InGaAsP on InP by gas-source molecular beam epitaxy
H. Asonen, K. Rakennus, K. Tappura, M. Hovinen and M. Pessa 101

Growth and silicon doping of $Al_xGa_{1-x}P$ on GaP by gas source molecular beam epitaxy
J.N Baillargeon, K.Y. Cheng, K.C. Hsieh and C.L. Wei 106

Diffusion limited δ-doping profiles in GaAs grown by gas source molecular beam epitaxy
J.E. Cunningham, T.H. Chiu, A. Ourmazd, W. Jan and K.Y. Kuo 111

Study of AlInP and GaInP grown by gas source molecular beam epitaxy (GSMBE)
M. Nakajima, A. Takamori, T. Yokotsuka, K. Uchiyama and T. Abe 116

CBE growth of AlGaAs/GaAs heterostructures and their device applications
Y.M. Houng 124

Chemical beam epitaxy of indium phosphide
J.L. Benchimol, F. Alaoui, Y. Gao, G. Le Roux, E.V.K. Rao and F. Alexandre 135

Growth of high purity InP by metalorganic MBE (CBE)
H. Heinecke, B. Baur, R. Höger and A. Miklis 143

GaAs/AlGaAs quantum well structures grown by gas-source MBE using TEG, TEA, and AsH_3
H. Ando, A. Sandhu, H. Ishikawa and T. Fujii 149

Atomic layer epitaxy of GaAs by chemical beam epitaxy
T.H. Chiu, J.E. Cunningham, A. Robertson, Jr. and D.L. Malm 155

Monolithically integrated InGaAs/InP MSM–FET photo-receiver prepared by chemical beam epitaxy
L. Yang, A.S. Sudbo, W.T. Tsang, P.A. Garbinski and R.M. Camarda 162

Carbon incorporation in AlGaAs grown by CBE
B.J. Lee, Y.M. Houng, J.N. Miller and J.E. Turner 168

MOMBE of InAs on GaAs
M. Kamp, M. Weyers, H. Heinecke, H. Lüth and P. Balk 178
Surface diffusion lengths of Ga molecules during GaAs MOMBE (metalorganic molecular beam epitaxy) growth
Y. Okuno, H. Asahi, T. Kaneko, T.W. Kang and S. Gonda 185
In situ XPS characterization of triethylgallium exposed GaAs and AlAs surfaces
T. Maeda, J. Saito and K. Kondo 191
The effects of arsenic overpressure in metalorganic molecular beam epitaxy of GaAs and InAs
C.W. Tu, B.W. Liang and T.P. Chin 195
Surface studies of the thermal decomposition of triethylgallium on GaAs (100)
A.J. Murrell, A.T.S. Wee, D.H. Fairbrother, N.K. Singh, J.S. Foord, G.J. Davies and D.A. Andrews 199
Growth kinetics in silane gas-source molecular beam epitaxy
M. Suemitsu, F. Hirose, Y. Takakuwa and N. Miyamoto 203
Anomalous temperature dependence of growth rate of GaAs grown by trimethylgallium and arsine molecular beams and two competing growth mechanisms
T. Isu, M. Hata and A. Watanabe 209
Studies of TMGa adsorption on thin GaAs and InAs (001) layers
B.Y. Maa and P.D. Dapkus 213
Transient behavior in RHEED intensity oscillations observed in chemical beam epitaxy of InP
Y. Morishita, M. Imaizumi, M. Gotoda, S. Maruno, Y. Nomura and H. Ogata 221
A RHEED and XPS study of $In_xGa_{1-x}As$ on GaAs grown by chemical beam epitaxy
A. Bensaoula, H. Hansen, H.C. Chen, J.T. Zborowski, K.D. Jamison, A. Ignatiev, H.D. Shih and Y.K. Tao 227
Surface segregation of indium during growth of InGaAs in chemical beam epitaxy
Y. Iimura, K. Nagata, Y. Aoyagi and S. Namba 230
Epitaxial growth of lattice matched metallic $ErP_{0.6}As_{0.4}$ on (001) and (111) GaAs with a GSMBE system
A. Le Corre, B. Guenais, A. Guivarc'h, D. Lecrosnier, J. Caulet, M. Minier, G. Ropars, P.A. Badoz and J.Y. Duboz 234
A study of metalorganic molecular beam epitaxy growth of InAs by mass spectrometry and reflection high-energy electron diffraction
B.W. Liang, T.P. Chin, L.Y. Wang and C.W. Tu 240
The effect of growth pause on the composition of InGaP/GaAs heterointerfaces
H.Y. Lee, M.J. Hafich and G.Y. Robinson 244
The growth of InP/InGaAs multi-quantum well modulator arrays by gas source MBE
E.G. Scott, M.H. Lyons, M.A.Z. Rejman-Greene and G.J. Davies 249
InGaAs/InP quantum well wires fabricated by GSMBE, MOCVD, and selective chemical etching techniques
M. Naganuma, M. Notomi, H. Iwamura, M. Okamoto, T. Nishida and T. Tamamura 254
Alternate sources and growth chemistry for OMVPE and CBE processes
G.B. Stringfellow 260
Substituted arsines as As sources in MOMBE
J. Musolf, M. Weyers, P. Balk, M. Zimmer and H. Hofmann 271
Monoethylarsine as a novel replacement for arsine in the vapor deposition of GaAs
D.M. Speckman and J.P. Wendt 275
A gas handling system for MOMBE growth
S.D. Hersee and J.M. Ballingall 282
Progress in the design of CBE systems
V.J. Mifsud, P.W. Sullivan and D. Williams 289
An integrated safety system for CBE
T.B. Joyce 299
A compact VCE growth system for in situ studies of epitaxy
P. Schmidt, K. Deppert, S. Jeppesen, J. Jönsson, G. Paulsson and L. Samuelson 306
Reflectance-difference detection of growth oscillations
G. Paulsson, K. Deppert, S. Jeppesen, J. Jönsson, L. Samuelson and P. Schmidt 312
Effects of high source flow and high pumping speed on gas source molecular beam epitaxy/chemical beam epitaxy
M.J. McCollum, S.L. Jackson, I. Szafranek and G.E. Stillman 316
Growth process of III–V compound semiconductors by migration-enhanced epitaxy
Y. Horikoshi, H. Yamaguchi, F. Briones and M. Kawashima 326
Improved 1.5 μm wavelength lasers using high quality LP-OMVPE grown strained-layer InGaAs quantum wells
P.J.A. Thijs, E.A. Montie, T. van Dongen and C.W.T. Bulle-Lieuwma 339
Macroscopic mechanism of group V interdiffusion in undoped InGaAs/InP quantum wells grown by MOVPE
T. Fujii, M. Sugawara, S. Yamazaki and K. Nakajima 348

Mg incorporation process during LP-MOVPE of InP, GaInAs and GaInAsP
E. Veuhoff, H. Baumeister, O. Brandt and R. Treichler 353
Metallic p-type GaAs and InGaAs grown by MOMBE
M. Konagai, T. Yamada, T. Akatsuka, S. Nozaki, R. Miyake, K. Saito, T. Fukamachi, E. Tokumitsu and K. Takahashi 359
Extremely high Be doped $Ga_{0.47}In_{0.53}As$ growth by chemical beam epitaxy
T.K. Uchida, T. Uchida, K. Mise, F. Koyama and K. Iga 366
Anomalous silicon and tin doping behaviour in indium phosphide grown by chemical beam epitaxy
P.J. Skevington, D.A. Andrews and G.J. Davies 371
Carbon dopiing of III–V compounds grown by MOMBE
C.R. Abernathy, S.J. Pearton, F. Ren, W.S. Hobson, T.R. Fullowan, A. Katz, A.S. Jordan and J. Kovalchick 375
Gaseous dopant sources in MOMBE/CBE
M. Weyers, J. Musolf, D. Marx, A. Kohl and P. Balk 383

Author index 393
Subject index 397